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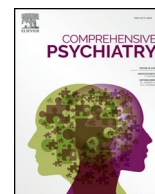
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Prior depression predicts greater stress during Covid-19 mandatory lockdown among college students in France

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ABSTRACT

Background: The Covid-19 pandemic and its related public health measures such as mandatory lockdowns have been shown to have an impact on mental health. A key question is the role of pre-existing psychiatric disorders in how such measures are experienced.

Methods: During the first country-wide lockdown imposed in France, a Covid-19 module was added to the French portion of the ongoing World Mental Health International college student survey. The present study focuses on respondents who completed the survey during that time frame ($n = 291$).

Results: Students with prior depression endorsed greater increases in anxiety (72.2% vs 50.9%) and stress (72.2% vs 49.4%), as well as greater decreases in concentration (87.0% vs 72.9%) during lockdown as compared to those without depression history. In multivariate analyses, prior depression was associated with overall stress (AOR = 5.50), financial stress (AOR = 1.95), family stress (AOR = 2.47), work related stress (AOR = 5.15), and stress related to loved ones (AOR = 2.21). Prior depression was also associated with greater probability experiencing increased anxiety (AOR = 2.61) and stress (AOR = 2.55) during lockdown.

Conclusions: The findings indicate that the best predictor of experiencing stress and anxiety during the first Covid-19 lockdown was a history of depression prior to the pandemic outbreak. Implementing public health measures such as mandatory national lockdowns should be accompanied by strategies for reaching out to those who are vulnerable due to a history of mental illness.

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1. Introduction

The Covid-19 pandemic is a life-changing and ongoing event that is affecting every region of the world. An increasing number of studies is emerging to document the deleterious impact of the pandemic on mental health [1–5]. Despite their necessity from a public health point of view, mandatory regional or country-wide lockdowns and other measures used to control the spread of the coronavirus also raise questions with regard to their impact on mental health. Like many countries in 2020, France imposed a nation-wide period of lockdown in response to the first wave of the Covid-19 pandemic starting in March 2020. What was originally intended to be a two-week period of home confinement would eventually last two full months. The measures implemented in France also limited the country's functioning to only allow essential workers in the areas of healthcare, law enforcement, food distribution and basic infrastructure to maintain their duties. As did all schools, universities promptly closed during the full duration of the

lockdown, prompting concerns regarding how this latter population would adjust in light of their specific characteristics and needs.

College students are a population that is particularly vulnerable to mental health problems given the challenges associated with the transition to adulthood, the economic and material hardship associated with initiating independent living, and the fact they correspond to the age of greatest risk for the most common forms of mental disorder [6,7]. During lockdown, all teaching was disrupted and needed to be rapidly replaced by online courses and final exams were frequently cancelled in favor of online testing. Those students who held part time jobs in non-essential professions lost income, and all in-person social or festive events were prohibited. Beyond these immediate concerns, it has also been suggested that this population was disproportionately burdened by concerns for their professional future due to the heavy impact of the pandemic on the global economy [3,5,8,9]. It is therefore not surprising that recent studies examining the mental health of college students during lockdown strongly suggest that this critical period is associated with greater stress. One study conducted during the first weeks of lockdown in Spain reported high levels of stress, anxiety and depression among students, comparatively higher to what was reported by university staff [10]. In France, students who had not relocated to stay with

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family during lockdown were more likely to experience stress in that time frame [11]. A recent systematic review of studies examining the psychological impact of the pandemic identified younger age (≤ 40 years) as one of the factors associated with distress in the general population [5].

Importantly, prior mental health status is key in understanding how lockdown affects a given population [5]. However, very little is known about whether individuals with a previous history of depression experience societal events such as mandatory lockdown as more stressful than those who have never been depressed, or if they might be more vulnerable to other psychological difficulties when confronted with such events. Depression is highly prevalent [12,13] including among college students [6], and it is also known to alter how subsequent stressors are processed as evidenced by stress sensitization whereby individuals' prior depression sensitizes them to later-occurring life events [14–16]. Prior depression may also influence the perceived negativity of subsequent stressors [17]. The goal of the present study is to therefore to examine how stress and anxiety were experienced during lockdown as a function of depression history in a sample of university students participating in the ongoing French portion of the World Mental Health International College Student surveys.

2. Methods

2.1. Participants and procedure

Data were drawn from an online survey designed to characterize mental health among first year students conducted in a French university as part of *Universanté*, the French portion of the World Mental Health International College Student surveys (WMH-ICS, https://www.hcp.med.harvard.edu/wmh/college_student_survey.php). All incoming first year students received an e-mail inviting them to take part in the survey during the 2019–2020 academic year. Several email reminders were sent, and flyers and posters advertised the study throughout the campus. Only respondents who were at least 18 years old at the time they completed the consent form were eligible. The survey included questions about sociodemographic characteristics, mental health, use of mental health services, personality factors and academic expectations. Participants were provided with a description of the study and informed consent was obtained prior to starting the survey. Recruitment and consent procedures were approved by an ethics committee (CCTIRS#15–527) and by the National Data Protection Authority (CNIL, Authorization#DR-2016-502). A brief section that was specific to Covid-19 was added to the survey while French residents were under mandatory lockdown (March and April 2020). The present study focuses solely on respondents who completed the survey during that time frame ($n = 291$), with a median survey duration of 35 min. The sample was 73.5% female, mean age 19.07 (SD = 1.70) and included students from Social Sciences (16.2%), Law and Economics (25.1%), Health Sciences (26.1%), and Science and Technology (32.6%).

2.2. Measures

2.2.1. Sociodemographic variables

Sociodemographic variables included sex and age (18 vs. 19+ years).

2.2.2. Characteristics of residence during lockdown

Respondents were asked where they were currently staying during lockdown and to specify whether they were in a rural vs urban area, the type of housing (apartment, student dorm or rented room, individual house) as well as its size in ft² (Less than 323ft²/30m², 323 to 538ft²/31 to 50m², 539 to 1076ft²/51 to 100m², 1077ft² or more/101m² or more) who they were currently staying with and whether they had access to a yard. Lastly, respondents were asked who they were currently staying with which was then categorized into: with

others including at least one parent, with others but without a parent, or alone.

2.2.3. Anxiety, alcohol use and stress levels during the lockdown period

Respondents were asked to specify if, since the beginning of the lockdown period, their level of anxiety, stress, concentration or use of alcohol “stayed the same”, “increased”, “decreased”, or whether the question was not applicable to them. For analysis, responses were recoded into increased vs did not increase (decreased or stayed the same) for anxiety, stress and alcohol use, and the reverse for concentration to reflect decrease in concentration.

2.2.4. Current level of stress

Respondents were also asked how much stress they currently experienced in each of the following areas of their life: finances, health, romantic relationships, relationships with family, relationships with work colleagues or other students, the health and problems experienced by significant others, and overall life stress based on items of the World Mental Health- Composite International Diagnostic Interview Screening Scales (WMH-CIDI) [40]. Respondents were invited to respond on a scale from “none” to “very severe” on a 5-point Likert scale. For analysis, each stress variable was recoded to reflect ‘moderate’ or ‘very severe’ stress (coded as 1) versus ‘no stress’ or ‘mild stress’ (coded as 0).

2.2.5. Lifetime mental disorders

The lifetime prevalence of common DSM-5 mental disorders was estimated using the Composite International Diagnostic Interview Screening Scales (CIDI) (Kessler et al., 2013; Kessler & Üstün, 2004), developed by the World Health Organization and adapted for WMH-ICS. In the present study, depression, generalized anxiety, panic disorder, and drug use disorder were assessed. Drug use disorder included any illicit substances including cannabis, cocaine, any other street drug, or a prescription drug either used without a prescription or used more than prescribed to ‘get high, buzzed, or feel numbed out’. In addition, the Alcohol Use Disorders Identification Test (AUDIT) [18] was used to estimate the prevalence of alcohol use disorder using either a total score of 16+ or a score 8–15 with 4+ on the AUDIT dependence questions [19] as a cut-off. For analysis, the presence or absence of lifetime disorder was established for anxiety disorders, and past year disorders for substance use disorders. For depression, rates of past month, and prior depression (defined as lifetime depression without past month depression) were estimated.

2.3. Data analysis

First, cross-tabulations and chi square tests were performed to compare those with and those without prior depression regarding basic sociodemographic variables and characteristics of their place of residence during mandatory lockdown. Second, a similar procedure was used to compare the two groups regarding past-month depression, lifetime anxiety disorders, 12-months substance use disorders, changes in mental health since lockdown began, and reported stress in specific life domains. Third, a series of logistic regressions were performed in the overall sample to determine multivariate predictors of each type of stress that exhibited a higher frequency in those with prior depression: overall stress, financial stress, health stress, family stress, work related stress, other stress affecting loved ones, increased level of anxiety and general stress, and decrease of concentration since lockdown began. The covariates included in the models were those associated at least marginally ($p < .20$) with prior depression: sex, the size or the residence during lockdown, the persons in the residence, the presence of prior depression, lifetime anxiety disorder, and 12-month substance use disorder. The significance level was set at $p < .05$ and all analyses were performed using R software version 3.6.3 and Rstudio software version 1.2.5042 [41].

3. Results

3.1. Sociodemographic and lockdown characteristics among first year students with or without prior depression

Comparisons between those with or without prior depression revealed no differences with regard to urban or rural location, size of residence, presence of a yard, type of residence or persons in the residence during lockdown (Table 1). Those with prior depression were more often female (81.7% vs 71.7%) although the difference did not reach significance ($p = .0597$), and there were no age differences.

3.2. Mental health status during lockdown among college students with or without prior depression

The prevalence of current and past diagnoses in the sample is presented in Table 2. Those with prior depression had significantly higher proportions of past month depression (32.4% vs 1.2%, $\chi^2(1) = 54.540$, $p < .0001$), lifetime anxiety disorder (19.8% vs 5.6%, $\chi^2(1) = 12.961$, $p = .0003$), and past year substance use disorder (13.5% vs 4.8%, $\chi^2(1) = 5.845$, $p = .0156$). In addition, those with prior depression also endorsed greater increases in anxiety (72.2% vs 50.9%, $\chi^2(1) = 712.289$, $p = .0005$) and stress (72.2% vs 49.4%, $\chi^2(1) = 14.030$, $p = .0002$), as well as greater decreases in concentration (87.0% vs 72.9%, $\chi^2(1) = 7.748$, $p = .0054$) during lockdown than did those without prior depression. While only few students identified themselves as current alcohol users, the reported increase in alcohol consumption among those with prior depression was not significantly greater than for those without. Concerning the specific forms of stress experienced during the lockdown period, each domain was significantly more frequent among those with prior depression with the exception of stress regarding the participants' romantic relationships and health of loved ones. Overall stress (84.3% vs 46.2%, $\chi^2(1) = 32.462$, $p < .0001$), financial stress (47.3% vs 26.9%, $\chi^2(1) = 9.687$, $p = .0019$), and problems getting

along with people at work or school (33.0% vs 8.5%, $\chi^2(1) = 21.274$, $p < .0001$) demonstrated the largest between-group differences.

3.3. Multivariate analyses predicting perceived stress categories during lockdown

In multivariate analyses, prior depression was the single most consistent predictor of the individual categories of stress while most of the other predictors lost significance (Table 3). Controlling for all other factors included in the model, prior depression was associated with increased odds of overall stress (AOR = 5.50; 95% CI = 2.59–11.68), financial stress (AOR = 1.95; 95% CI = 1.02–3.71), family stress (AOR = 2.47; 95% CI = 1.24–4.94), work related stress (AOR = 5.15; 95% CI = 2.18–12.20), and stress related to loved ones (AOR = 2.21; 95% CI = 1.19–4.12). A lifetime history of anxiety disorder was only associated with overall stress (AOR = 5.32; 95% CI = 1.11–25.43), and substance use disorders were associated with health-related stress (AOR = 3.56; 95% CI = 1.17–10.81).

3.4. Multivariate analyses predicting increased anxiety, stress, and decreased concentration during lockdown

Multivariate models examining increases in anxiety and stress as well as decreases in concentration are presented in Table 4. Prior depression was associated with greater odds of having reported increased levels of anxiety (AOR = 2.61; 95% CI = 1.43–4.77) and stress (AOR = 2.55; 95% CI = 1.38–4.69) during lockdown. None of the other factors included in the model including sex, size of the residence during lockdown, persons the students were in lockdown with, prior anxiety disorder or past year substance use disorder were associated with reported changes in stress, anxiety or concentration during lockdown.

4. Discussion

The Covid-19 pandemic disproportionately affected persons with mental disorders [5,20], and this may be particularly true for individuals with a history of depression. To date, however, few studies pertaining to the Covid-19 pandemic have taken into account prior mental health status. This issue is particularly relevant to depression in light of indications that stressful life events may play a different role in the first occurrence of this disorder than in the onset of subsequent episodes [21,22]. While stressful life events are a well-documented risk factor for depression onset [23,24], the first occurrence of this disorder may increase individual sensitivity to the subsequent events [17] as well as contribute to the generation of stress itself [25,26]. Within this context, a key question concerns the manner in which mandatory lockdown was experienced by persons with a history of depression as it may help identify specific vulnerabilities of these individuals that can be used to improve resources applied in future public health crises.

The current findings indicate that individuals with a prior history of depression experienced greater perceived stress across diverse life domains, as well as increases in anxiety and concentration problems. Regardless of whether these effects are explained by subjective evaluations of events or to objective differences in the frequency or intensity of stress, they suggest that individuals with a history of this disorder experienced lockdown more negatively than individuals who had never been depressed. These effects were also associated with the conditions of lockdown, with smaller living spaces being associated with greater perceived stressfulness of events. Such findings should be interpreted relative to the characteristics of the sample that was composed of young university students, and where smaller living spaces may suggest that many individuals experienced lockdown within student housing conditions. These individuals may therefore have been less likely to benefit from family resources and support known to buffer the effects of stress and reduce depression risk (for reviews, see [27,28]). However, as the first onset of depression most often occurs in late

Table 1
Sociodemographic and lockdown characteristics among first year students with or without prior depression.

	No prior depression n = 166			Prior depression n = 109			Between-group differences	
	n	%	SE	n	%	SE	χ^2 test	p value
Sex Female	119	71.7	3.50	89	81.7	3.70	3.545	0.0597
Age							0.476	0.4901
18	74	44.6	3.86	44	40.4	4.70		
19 or older	92	55.4	3.86	65	59.6	4.70		
Location							0.742	0.3891
Urban	76	46.1	3.88	55	51.4	4.83		
Rural	89	53.9	3.88	52	48.6	4.83		
Size of the residence in square meters							5.605	0.1325
Less than 323ft ²	13	7.9	2.11	15	13.9	3.33		
323 to 538ft ²	13	7.9	2.11	5	4.7	2.04		
539 to 1076ft ²	55	33.6	3.69	44	40.7	4.73		
1077ft ² or more	83	50.6	3.90	44	40.7	4.73		
Type of residence							1.743	0.4184
Student dorm or rented room	9	5.4	1.76	8	7.4	2.52		
Apartment	31	18.8	3.04	26	24.1	4.12		
Individual house	125	75.8	3.33	74	68.5	4.47		
Access to a garden	124	74.7	3.37	75	69.4	4.43	0.909	0.3405
Persons in the residence							4.538	0.1034
Alone	9	5.5	1.77	11	10.2	2.91		
With others including a parent	138	83.6	2.88	79	73.1	4.27		
With others but without a parent	18	10.9	2.43	18	16.7	3.59		

Table 2
Lifetime mental health status and perceived changes in mental health during lockdown among college students with or without prior depression.

	No prior depression n = 166			Prior depression n = 109			Between-group differences	
	n	%	SE	n	%	SE	χ ² test	p value
Past month major depression	2	1.2	0.85	35	32.4	4.50	54.540	<0.0001
Lifetime anxiety disorder	9	5.6	1.81	21	19.8	3.87	12.961	0.0003
Past year substance use disorder	7	4.8	1.77	13	13.5	3.49	5.845	0.0156
Since lockdown began:								
Increase in general level of anxiety	84	50.9	3.89	78	72.2	4.31	12.289	0.0005
Increase in general level of stress	82	49.4	3.88	78	72.2	4.31	14.030	0.0002
Increase in the use of alcohol among users	7	6.2	2.27	8	10.4	3.48	1.108	0.2925
Decrease in concentration	121	72.9	3.45	94	87.0	3.24	7.749	0.0054
Stress experienced by area:								
Your life overall	60	46.2	4.37	75	84.3	3.86	32.462	<0.0001
Your financial situation	35	26.9	3.89	43	47.3	5.23	9.687	0.0019
Your health	27	20.8	3.56	32	35.2	5.01	5.669	0.0173
Your romantic life	37	28.9	4.01	34	37.4	5.07	1.736	0.1876
Your relationships with your family	26	20.2	3.53	32	35.2	5.01	6.192	0.0128
Problems getting along with people at work or school	11	8.5	2.45	30	33.0	4.93	21.274	<0.0001
The health of your loved ones	79	60.8	4.28	60	65.9	4.97	0.612	0.4341
Other problems experienced by your loved ones	39	30.0	4.02	43	47.3	5.23	6.828	0.0090

adolescence or early adulthood [12,29] and that a significant portion of individuals in this age range pursue higher education under independent-living conditions, this population constitutes an important target for prevention and early intervention strategies.

The mental health risks posed by Covid-19 lockdown and other public health measures related to the pandemic have important but complex clinical implications. Similar to the logistic barriers that lockdown may present for the treatment of physical diseases by reducing access to medications or clinic-based services, depression may be worsened by the very public health measures needed to control the spread of the virus. The challenge therefore resides in designing outreach programs for persons with depression and other mental disorders that directly compensate for imposed social isolation and activity reduction, as well as that combat the experience of anxiety or sense of vulnerability that may accompany global health crises. While the prevalence of psychological distress and mental disorders among college students is elevated [6,7], several studies have shown that as compared to young people in the same age-range who are not attending college, college students do not display a significantly higher rate of depression [30,31]. It is

therefore noteworthy to underline the need to consider reaching out to a broader range of young people with a prior history of depression during health crises. Unprecedented opportunities are now available through mobile technologies and internet-based services that provide an essential tool for responding to this need. However, while these new technologies have demonstrated their feasibility, validity and efficacy in the treatment of depression [32–34], such resources were not mobilized through coordinated national or international efforts during the first Covid-19 lockdown period. In light of the high prevalence of this disorder and its severe individual and economic burden [35,36], the preparation of such programs for future deployment appears to be an important priority. Over a decade ago, the SARS epidemic had prompted concerns over the mental health consequences of infectious diseases [37,38] and highlighted the need for public health preparedness in case of future outbreaks [39]. The magnitude of the Covid-19 pandemic seems to have surpassed such efforts and again underscores the need for more extensive resources and planning.

Several limitations of the methodology applied by the current study deserve attention in interpreting the findings. First, as the participants

Table 3
Multivariate analyses predicting moderate to very severe overall stress, and stress with regard to finances, health, family, work and stress regarding problems experienced by close others during lockdown.

	Overall stress (n = 212)		Financial stress (n = 214)		Health stress (n = 214)		Family stress (n = 213)		Work stress (n = 214)		Stress concerning other problems experienced by loved ones (n = 214)	
	AOR	CI	AOR	CI	AOR	CI	AOR	CI	AOR	CI	AOR	CI
Sex Female	2.61	1.24–5.48	0.97	0.47–1.99	1.34	0.61–2.95	1.52	0.67–3.42	0.48	0.20–1.16	1.59	0.78–3.24
Size of the residence												
Less than 323ft ²	ref		ref	*	Ref		ref		ref	*	ref	
323 to 538ft ²	0.70	0.04–11.26	0.34	0.05–2.37	0.39	0.06–2.55	0.70	0.12–4.15	0.12	0.01–1.49	0.83	0.14–4.79
539 to 1076ft ²	0.34	0.03–4.62	0.23	0.04–1.43	0.32	0.07–1.54	0.22	0.04–1.09	0.12	0.02–0.73	0.89	0.19–4.09
1077ft ² or more	0.19	0.01–2.57	0.15	0.02–0.92	0.44	0.09–2.12	0.30	0.06–1.49	0.15	0.02–0.95	0.85	0.18–3.95
Persons in the residence												
With others including a parent	ref		ref		ref		ref		ref		ref	
With others but without a parent	0.36	0.12–1.14	2.31	0.86–6.23	1.45	0.50–4.16	0.60	0.19–1.89	0.28	0.06–1.29	1.00	0.37–2.70
Alone	0.32	0.02–5.58	0.62	0.09–4.51	0.39	0.06–2.63	0.25	0.04–1.64	0.29	0.04–2.35	0.95	0.16–5.63
Prior depression	5.50	2.59–11.68	1.95	1.02–3.71	1.94	0.97–3.88	2.47	1.24–4.94	5.15	2.18–12.20	2.21	1.19–4.12
Lifetime anxiety disorder	5.32	1.11–25.43	1.66	0.66–4.16	0.95	0.36–2.53	1.16	0.45–2.98	1.41	0.50–4.01	0.68	0.27–1.68
12-month drug or alcohol use disorder	1.05	0.26–4.30	1.02	0.32–3.30	3.56	1.17–10.81	1.31	0.41–4.26	2.12	0.63–7.12	1.26	0.42–3.83

Note. * for financial stress: likelihood test's p-value = .129 for size of residence. * for work stress: likelihood test's p-value = .102 for size of residence. AORs are adjusted for all variables presented in the table.

Table 4

Multivariate analyses predicting increased level of anxiety and general stress, and decrease of concentration since lockdown began.

	Increase in general level of anxiety (n = 238)		Increase in general level of stress (n = 239)		Decrease in concentration (n = 239)	
	AOR	CI	AOR	CI	AOR	CI
Sex Female	1.73	0.93–3.25	2.03	1.08–3.84	1.64	0.80–3.37
Size of the residence						
Less than 323ft ²	ref		ref		ref	
323 to 538ft ²	0.82	0.18–3.76	1.46	0.32–6.58	0.17	0.02–1.60
539 to 1076ft ²	0.90	0.23–3.62	2.24	0.57–8.83	0.25	0.02–2.46
1077ft ² or more	0.70	0.17–2.81	1.70	0.43–6.75	0.25	0.02–2.52
Persons in the residence						
With others including a parent	ref		ref		ref	
With others but without a parent	1.29	0.49–3.38	2.64	0.92–7.59	2.30	0.58–9.16
Alone	0.97	0.20–4.65	1.19	0.25–5.58	0.22	0.02–2.18
Prior depression	2.61	1.43–4.77	2.55	1.38–4.69	1.93	0.90–4.11
Lifetime anxiety disorder	0.78	0.33–1.84	0.70	0.30–1.66	0.98	0.32–2.97
12-month substance use disorder	1.03	0.37–2.88	0.67	0.24–1.87	5.70	0.70–46.20

Note. AORs are adjusted for all variables presented in the table.

constituted a time-limited subsample from a larger ongoing survey, the sample cannot be construed as representative of the overall population of university students. That being said, the objective of the study was to examine the association between prior depression and lockdown-related outcomes and did not seek to determine the prevalence of depression among the overall student population. The limited sample size prevented us from examining the association of specific mental disorders with relevant outcomes. For instance, current depression could not be included in multivariate analyses, GAD and panic disorder were combined into a single category of anxiety disorders, and 12-month alcohol and drug use disorders combined into a single category of substance use disorders. An additional concern is that the survey did not allow us to examine certain conditions such as lifetime alcohol use disorders or others forms of comorbidity that may be of particular interest for depression or for individuals in this age range. In the same way, the current focus on depression history should not detract attention from other disorders such as schizophrenia or obsessive-compulsive disorder that may be associated with specific reactions to the Covid-19 pandemic. Despite these limitations, the findings shed light on the particular difficulties that can be experienced by individuals with a depression history under conditions that require dramatic changes to social interactions and daily life habits.

5. Conclusions

The Covid-19 is not first international viral pandemic, and it is certain to not be the last. However, it is unique in terms of several characteristics that provide important lessons that may increase our preparedness to reduce the impact of future crises. It is now increasingly apparent that such pandemics can aggravate diverse forms of illness due to reduced access to care, but mental disorders are of particular concern in light of their high prevalence and vulnerability to public health measures that may increase social isolation or activity restriction. Mobile and fixed internet-based technologies now exist that can respond to some of these needs in ways that were never before possible, but their availability and use require careful preparation and investment far in advance of future sanitary or societal crises. However, a necessary first step is to understand who may be at particular risk when confronted with such events. Gaining knowledge of an individual's personal history of mental disorder provides essential information for this objective.

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Declaration of Competing Interest

None.

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